

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	Customer No.: 27182
Thomas J.Hunt et al.	Confirmation No.: 3290
Application No.: 10/668,255	Group Art Unit: 1793
Filed: 9/24/2003	Examiner: Stoner, Kiley S.
Title: METHOD FOR BONDING A SPUTTER TARGET TO A BACKING PLATE AND THE ASSEMBLY THEREOF	Docket No. 21256

REPLY AND AMENDMENT
PURSUANT TO 37 C.F.R. §1.116

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

This is in response to the Official Action issued June 30, 2009. The Examiner set a three-month period. Attached is a two-month petition of time, making this Reply and Amendment due on or before November 30, 2009.

The **Listing of Claims** begins on page 2 of this paper.

Remarks appear on page 7 of this paper.

Listing of Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A method for forming a solder bonded sputter target/backing plate assembly comprising the steps of:
 - a) forming a backing plate with a bonding surface having a plurality of segmented and spaced-apart ridges that are disposed on and within the periphery of the bonding surface of the backing plate, which perform as spacers/standoffs for the supply of solder material between said backing plate and a sputter target;
 - b) forming said sputter target from a ferromagnetic material and having a sputtering surface and substantially flat bonding surface;
 - c) applying said solder material to the interface spaces defined by superimposing said sputter target within the periphery of and onto the plurality of ridges on the backing plate; and
 - d) allowing said solder material to solidify and bond the sputter target to the backing plate so that the plurality of ridges provide an effective uniform thickness solder bonded interface.
2. (Original) The method of claim 1 wherein the backing plate and sputter target are disc-shaped.

3. (Original) The method of claim 1 wherein the ridges on the bonding surface of the backing plate have a shape selected from the group comprising a circle, arcuate, square, rectangular, polygon and combination thereof.
4. (Original) The method of claim 1 wherein the height of the ridges is between about 0.005 inch and about 0.050 inch.
5. (Original) The method of claim 1 where the thickness of the width of the ridges is between about 0.005 inch and about 0.050 inch.
6. (Original) The method of claim 3 wherein the ridges are arcuate-shaped.
7. (Original) The method of claim 6 wherein the height of the ridges is between about 0.010 inch and about 0.030 inch and the thickness of the width of the ridges is between about 0.010 inch and about 0.030 inch.
8. (Original) The method of claim 7 wherein the height of the ridges is about 0.020 inch.
9. (Original) The method of claim 8 wherein the thickness of the width of the ridges is about 0.020 inch.

10. (Original) The method of claim 6 wherein the radial distance between the adjacent arcuate ridges is between about 0.2 inch and 2.0 inch.

11. (Original) The method of claim 10 wherein the height of the ridges is between about 0.010 inch and about 0.030 inch and the thickness of the width of the ridges is between about 0.010 inch and about 0.030 inch.

12. (Original) The method of claim 1 wherein the sputter target is selected from the group comprising titanium, aluminum, copper, molybdenum, cobalt, chromium, ruthenium, rhodium, palladium, silver, iridium, platinum, gold, tungsten, silicon, tantalum, vanadium, nickel, iron, manganese, germanium, and alloys thereof.

13. (Original) The method of claim 1 wherein the backing plate is selected from the group comprising copper, aluminum, titanium, and alloys thereof.

14. (Original) The method of claim 1 wherein the solder is liquid or paste and selected from the group comprising tin-lead, indium-tin, tin-silver, tin-copper, or tin-silver-copper.

15. (Original) The method of claim 14 wherein the sputter target is selected from the group comprising titanium, aluminum, copper, molybdenum, cobalt, chromium, ruthenium, rhodium, palladium, silver, iridium, platinum, gold, tungsten, silicon, tantalum, vanadium, nickel, iron, manganese, germanium, and alloys thereof.

16. (Original) The method of claim 15 wherein the sputter target is selected from the group comprising cobalt, nickel, and alloys thereof.

17. (Original) The method of claim 16 wherein the height of the ridges is between about 0.010 inch and about 0.030 inch and the thickness of the width of the ridges is between about 0.010 inch and about 0.030 inch.

18. (Currently Amended) A solder bonded sputter target/backing plate assembly comprising a backing plate having a plurality of segmented spaced-apart ridges disposed on and within the periphery of the bonding surface of said backing plate, which perform as spacers/standoffs upon supplying a solder material between said backing plate and a sputter target; said sputter target being made of a ferromagnetic material and having a substantially flat sputter surface and a bond surface; said sputter target superimposed onto the plurality of ridges on the bonding surface of the backing plate; and a solder bonded layer disposed between the sputter target and backing plate and between the ridges producing an effective uniform thickness solder bonded interface for the sputter target/backing plate.

19. (Original) The solder bonded sputter target/backing plate assembly of claim 18 wherein the sputter target is selected from the group comprising titanium, aluminum, copper, molybdenum, cobalt, chromium, ruthenium, rhodium, palladium, silver, iridium, platinum, gold, tungsten, silicon, tantalum, vanadium, nickel, iron, manganese, germanium, and alloys thereof.

20. (Original) The solder bonded sputter target/backing plate assembly of claim 18 wherein the bonded solder is selected from the group comprising tin-lead, indium-tin, tin-silver, tin-copper, or tin—silver-copper.

REMARKS

Re-examination and reconsideration of the subject matter identified in caption, as amended, pursuant and consistent with 37 C.F.R. § 1.116 and in light of the remarks which follow are respectfully requested.

As correctly noted in the Office Action Summary, Claims 1-20 are pending in the application, and under consideration. By the above amendments, independent claims 1 and 18 have been revised to more recite the material from which the sputter target is made. Support may be found, at least in paragraph 25.

Claim Rejections - 35 USC § 112

Claims 3 and 6-11 stand rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the written description requirement. This rejection is traversed for the following reasons.

In accordance to reasons set forth at page 2 of the Official Action, the specification allegedly does not provide support for the various configuration of “arcuate-shaped” ridges claimed. This position is improper. These configurations are fully described and supported at paragraph 20 of Applicants’ Specification. Moreover, claim 3, where the specific configuration is recited is an original claim, as filed. Thus, it forms part of the original disclosure. As such, for all of the foregoing reasons withdrawal of this rejection is respectfully requested.

Claim Rejections - 35 USC § 102

Claims 1-11 and 18 stand rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Ogata et al. (Japanese Patent Document No. 02043362 A); and claims 1, 3, 4, 13, 14, 18 and 20 stand rejected under §102(b) as allegedly being anticipated by Fukumoto et al. (Japanese Patent Document No. 11-200028-A). The claims, as now presented, cannot be rejected over these documents for the following reasons.

The present invention relates to a method of bonding a sputter target to a backing plate, and more specifically, the use of a backing plate having spaced-apart ridges on the bonding surface of the backing plate.

In accordance with one aspect of the invention, and as set forth in independent claim 1, a method for forming a solder bonded sputter target/backing plate assembly is provided. The method includes (a) forming a backing plate with a bonding surface having a plurality of segmented and spaced-apart ridges that are disposed on and within the periphery of the bonding surface of the backing plate, which perform as spacers/standoffs for the supply of solder material between said backing plate and a sputter target; (b) forming the sputter target from a ferromagnetic material and having a sputtering surface and substantially flat bonding surface; (c) applying the solder material to the interface spaces defined by superimposing the sputter target within the periphery of and onto the plurality of ridges on the backing plate; and (d) allowing the solder material to solidify and bond the sputter target to the backing plate so that the plurality of ridges provide an effective uniform thickness solder bonded interface.

Ogata et al. pertains to a method of joining a sputter target and a backing plate by a brazing material. Ogata et al., however, does not disclose the features of the present invention. For example, Ogata et al does not concern the uniform thickness of a target assembly in order to achieve optimal thickness and sheet resistance uniformity of sputtered films. In this regard, the presently claimed invention recites the spaced apart ridges to be segmented to accommodate the solder supplied between the backing plate and the sputter target which is made of ferromagnetic materials. Thus, the sputtering target and the backing plate have similar coefficients of thermal expansion, and the ridges act as spacers to ensure a substantially uniform solder thickness. By comparison, Ogata et al. simply provides channels (e.g., grooves or slots) in the bonding surface of the backing plate, which appear to extend over the entire surface of the backing plate for the purpose of minimizing warping that occurs during bonding of materials having a large difference in thermal expansion. In this regard, the Examiner's attention is

drawn to the materials bonded in Ogata et al. They are rare earth materials bonded to copper. These materials have a large difference in thermal expansion, and the bonding would create warping, but for the channels formed in the backing plate. By comparison, in the present invention it is a solder material which unites the backing plate and the sputtering target (e.g., materials having a similar thermal expansion) and leads to the use of an effective uniform thickness solder bonded interface.

Clearly, Ogata et al. does not disclose raised protrusions in the form of segmented space-apart ridges on the bonding surface of the backing plate to accommodate the solder and provide a uniform thickness interface. Neither the structure nor the processes of making the structure are the same as those suggested by Ogata et al.

Fukumoto et al., like Ogata et al. relates to bonding of a target and backing plate with substantially different thermal expansion differential. In order to accommodate this differential, Fukumoto et al. provides for tape-shaped spacers placed between the target and the backing plate to minimize warping during the bonding of brittle ceramic materials such as ITO (tin doped indium oxide) to copper. In stark contrast, the present invention calls for a plurality of spaced-apart ridges machined on the bonding surface of the backing plate. The purpose of the ridges is to obtain a uniform bond layer thickness, which is especially important to the performance of ferromagnetic targets. In this regard, ferromagnetic materials such as nickel and cobalt have coefficients of thermal expansion that are close to that of copper. Thus, clearly the target assembly and the method of manufacturing same in Ogata et al. and Fukumoto et al. are different from the present invention. Accordingly, withdrawal of these rejections is in order and it is respectfully requested.

Claim Rejections - 35 USC § 103

Claims 12-17, 19 and 20 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Ogata et al. in view of Ivanov (U.S. Patent

Application Publication No. 2005/0284746); and claims 5, 12, 15-17 and 19 stand rejected under §103(a) as allegedly being unpatentable over Fukumoto et al. These rejections are traversed for the following reasons.

Ogata et al. has been discussed in detail above. Ivanov relates to a sputter target/backing plate joining technique and assemblies made thereby. See paragraph 3. Ivanov has been relied on for the disclosure of a solder comprising Sn-Ag-Cu to form a bond between the backing plate and the sputter target. Official Action at page 6. However, Ivanov does not cure the above-discussed deficiencies in Ogata et al. Specifically, Ogata et al. does not disclose or suggest forming a backing plate with a bonding surface having a plurality of spaced-apart ridges that are disposed on and within the periphery of the bonding surface of the backing plate for the reasons discussed above. Fukumoto et al., has been discussed with respect to the independent claims. Even assuming, *arguendo*, that Fukumoto et al. discloses the features of the dependent claims, this document is still deficient with respect to the features of the independent claims, discussed above. Thus, for the foregoing reason withdrawal of both these rejections is in order, and it is respectfully requested.

CONCLUSION

On the basis of the foregoing amendment and response, Applicants respectfully submit that the claims are in condition for allowance. Favorable action on the merits is respectfully requested. If there are any questions regarding this response, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Applicants believe that this response is timely and that no further fees are due with this response. However, in the event that a fee or credit is owed or due, the Commissioner is authorized to charge or credit any deficiency/overpayment to Deposit Account No. 16-2440.

Respectfully submitted,



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